

Claims

- [c1] A system for displaying at a user device output produced by an application program executing on a server, the system comprising:
- an application server executing an application program;
 - a proxy server receiving from said application server data representing a screen of graphical display output produced by the application program;
 - a user device executing a client application, said client application receiving from said proxy server static image data representing the screen of graphical display output produced by the application program.
- [c2] The system of claim 1 wherein said application server comprises one of a plurality of servers in a server farm.
- [c3] The system of claim 1 wherein said proxy server receives input transmitted from said client application and transmits the received input to said application server.
- [c4] The system of claim 1 wherein said proxy server receives data from said application server via a presentation protocol.

- [c5] The system of claim 1 wherein said proxy server receives data from said application server via the Independent Computing Architecture (ICA) protocol.
- [c6] The system of claim 1 wherein said proxy server receives data from said application server via the Remote Display Protocol (RDP).
- [c7] The system of claim 1 wherein said proxy server modifies the data received from said application server.
- [c8] The system of claim 7 wherein said proxy server scales the data received from said application server.
- [c9] The system of claim 7 wherein said proxy server modifies the color depth of the data received from said application server.
- [c10] The system of claim 7 wherein said proxy server performs lossy image compression on the data received from said application server.
- [c11] The system of claim 1 wherein said proxy server receives from said application server data representing a change in a screen of graphical display output produced by the application program and transmits updated static image data to said client application.
- [c12] The system of claim 11 wherein the updated static image

data is transmitted by said proxy server after a predetermined period of time has elapsed.

- [c13] The system of claim 1 wherein the static image data received by said client application comprises at least a portion of an image file in GIF format.
- [c14] The system of claim 1 wherein the static image data received by said client application comprises at least a portion of an image in JPEG format.
- [c15] The system of claim 1 wherein said client application receives static image data from said proxy server via the Hyper Text Transfer Protocol (HTTP).
- [c16] The system of claim 1 wherein said client application comprises a JAVA application.
- [c17] The system of claim 1 wherein said client application uses less than 50 KB of memory during execution.
- [c18] The system of claim 1 wherein said client application requests updated static image data from said proxy server.
- [c19] The system of claim 1 wherein said user device comprises a cell phone.
- [c20] A method for displaying at a user device output produced by an application program executing on a server,

the method comprising the steps of:

- (a) executing, by an application server, an application producing a screen of graphical user interface data;
- (b) transmitting to a proxy server, by the application server, the screen of produced graphical user interface data;
- (c) transmitting to a user device, by the proxy server, static image data representing at least a portion of the screen of produced graphical user interface data; and
- (d) displaying, by the user device, the transmitted static image data.

[c21] The method of claim 20 further comprising the step of formatting, by the application server, the screen of graphical user interface data produced by the executing application into at least a first message in a presentation protocol format.

[c22] The method of claim 20 further comprising the step of formatting, by the application server, the screen of graphical user interface data produced by the executing application into at least a first message in Independent Computing Architecture (ICA) protocol format.

[c23] The method of claim 20 further comprising the step of formatting, by the application server, the screen of graphical user interface data produced by the executing

application into at a first message in Remote Display Protocol (RDP) format.

- [c24] The method of claim 20 further comprising the step of creating, by the proxy server, a static image file representing at least a portion of the screen of produced graphical user interface data.
- [c25] The method of claim 20 further comprising the step of modifying, by the proxy server, the data received from the application server.
- [c26] The method of claim 25 wherein said modifying step comprises applying lossy image compression to the data received from the application server.
- [c27] The method of claim 25 wherein said modifying step comprises changing the color depth of the data received from the application server.
- [c28] The method of claim 25 wherein said modifying step comprises scaling the data received from the application server.
- [c29] The method of claim 18 wherein step (c) comprises transmitting to a user device, by the proxy server, GIF image data representing at least a portion of the screen of graphical user output.

- [c30] The method of claim 20 wherein step (c) comprises transmitting to a user device, by the proxy server, JPEG image data representing at least a portion of the screen of graphical user output.
- [c31] The method of claim 20 wherein step (c) comprises transmitting to a user device via the Hyper Text Transfer Protocol (HTTP), by the proxy server, static image data representing at least a portion of the screen of produced graphical user interface data.
- [c32] The method of claim 20 further comprising the step of receiving, by the proxy server, data representing input from the user device.
- [c33] The method of claim 32 further comprising the step of transmitting, by the proxy server, the received user input data to the application server.
- [c34] The method of claim 20 further comprising the step of receiving, by the proxy server, data from the application execution server representing a change in the screen of produced graphical user interface data.
- [c35] The method of claim 34 further comprising the step of transmitting to a user device, by the proxy server, static image data representing the changed screen of produced

graphical user interface data.

[c36] The method of claim 35 wherein said transmitting step occurs after a predetermined period of time has elapsed.

[c37] The method of claim 20 further comprising the step of transmitting, by the client application, a request for updated static image information.

[c38] An apparatus for displaying at a user device output produced by an application program executing on a server, the apparatus comprising:

a first protocol handler receiving from an application server data in a first protocol format, the data representative of a screen of graphical display output produced by an application executing on the application server; and

a second protocol handler transmitting to a client application for display static image data in a second protocol format, the static image data representative of at least a portion of the screen of graphical display output received by the first protocol handler.

[c39] The apparatus of claim 38 wherein the second protocol handler receives from the client application data representative of user input.

[c40] The apparatus of claim 39 wherein the first protocol

handler transmits to the application server the data representative of user input received by the second protocol handler.

[c41] The apparatus of claim 38 wherein the first protocol handler translates the received data from the first protocol to the second protocol.

[c42] The apparatus of claim 38 wherein the second protocol handler translates the received data from the first protocol to the second protocol.

[c43] The apparatus of claim 38 further comprising a translation module accessing the data received by the first protocol handler in the first protocol and translating it into at least one message in the second protocol format.

[c44] A method for displaying at a user device graphical display output produced by an application program executing on a server, the method comprising the steps of:
(a) receiving from an application server, via a first protocol, data representative of a screen of graphical display output produced by an application executing on the application server; and
(b) transmitting to a client application for display, via a second protocol, static image data representative of at least a portion of the screen of graphical display output

produced by the application executing on the application server.

[c45] The method of claim 44 further comprising the step of receiving from the client application, via the second protocol, data representative of user input to the application program.

[c46] The method of claim 45 further comprising the step of transmitting to the application server, via the first protocol, data representative of user input received from the client application.

[c47] The method of claim 44 further comprising the step of translating the data representative of the screen of graphical display output from the format of the first protocol to the format of the second protocol.

[c48] The method of claim 44 wherein step (b) comprises transmitting to a client application for display, via a second protocol, GIF data representative of at least a portion of the screen of graphical display output of the application executing on the application server.

[c49] The method of claim 48 wherein the GIF file is transmitted to the client application via the HyperText Transfer Protocol (HTTP).

- [c50] The method of claim 44 wherein step (b) comprises transmitting to a client application for display, via a second protocol, JPEG data representative of at least a portion of the screen of graphical display output of the application executing on the application server.
- [c51] A system for displaying at a user device output produced by an application program executing on a server, the system comprising:
an application server executing an application program;
a proxy server receiving from said application server data representing a screen of graphical display output produced by the application program via a presentation-level protocol;
a user device executing a client application, said client application receiving from said proxy server static image data representing the screen of graphical display output produced by the application program via HyperText Transfer Protocol (HTTP) commands.
- [c52] A method for displaying at a user device output produced by an application program executing on a server, the method comprising the steps of:
(a) executing, by an application server, an application producing a screen of graphical user interface data;
(b) transmitting to a proxy server via a presentation-level protocol, by the application server, the screen of pro-

duced graphical user interface data;
(c) transmitting to a user device via HyperText Transfer Protocol (HTTP) commands, by the proxy server, static image data representing at least a portion of the screen of produced graphical user interface data; and
(d) displaying, by the user device, the transmitted static image data.

[c53] An article of manufacture having embodied thereon computer-readable program means for displaying at a user device output produced by an application program executing on a server, the article of manufacture comprising:
computer-readable program means for transmitting to a proxy server a screen of graphical user interface data produced by an application executing on the server;
computer-readable program means for communicating to a user device, by the proxy server, static image data representing at least a portion of the screen of produced graphical user interface data; and
computer-readable program means for displaying, by the user device, the transmitted static image data.

[c54] An article of manufacture having embodied thereon computer-readable programs means for displaying at a user device graphical display output produced by an application program executing on a server, the article of

manufacture comprising:

computer-readable program means for receiving from an application server, via a first protocol, data representative of a screen of graphical display output produced by an application executing on the application server; and computer-readable programs means for transmitting to a client application for display, via a second protocol, static image data representative of at least a portion of the screen of graphical display output produced by the application executing on the application server.